Economic Reforms and Human Development: Evidence from Transition Economies

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Abstract

Do market-oriented economic reforms result in higher levels of human well-being? This paper studies the impact of macro-level institutional and infrastructure reforms on the economic, educational and health dimensions of human well-being among 25 transition economies. We use panel data econometrics based on the LSDVC technique to analyse the effects of market-oriented reforms on the Human Development Index (HDI), as a measure of human well-being, from 1992 to 2007. The results show the complexity of reform impacts in transition countries. They show that institutional and economic reforms led to positive economic effect and significant impacts on other dimensions of human development. We find some positive economic impacts from infrastructure sectors reforms. However, not every reforms measure appears to generate positive impacts. Large-scale privatizations show negative effects in health and economic outcomes. The overall results show the importance of the interaction among different reform measures and the combined effect of these on human development.

Keywords: human development, transition economies, institutions, market reforms

JEL Classification: C33, P28, O27

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1. Introduction

Human development is defined as '*a process of enlarging people's choices consisting of at least three essential components such as long and healthy life, knowledge accumulation and resources to maintain a good standard of living*' (UNDP, 1990, p. 10). Most policymakers and scholars anticipate that overall economic reforms including openness to international trade; macroeconomic stabilisation, price liberalisation and enforcement of laws, regulation and proper institutions improve human and economic development by enlarging capabilities of and choices among individuals.

Past studies have showed a positive overall influence on human well-being and welfare (measured by the 'human development index' (HDI)) due to globalization and free market systems through a plethora of mechanisms (see Sirgy et al. 2004; Tsai, 2007). However, the empirical consequences of high-level market-oriented reforms on human well-being remain largely unsettled. This paper proposes an empirical framework for assessing the impact of market-oriented institutional and infrastructure reforms on the well-being in *'transition countries'*.

The transition countries include twenty-nine economies of Central and Eastern Europe and the Former Soviet Union (FSU)[1]. They provide a rare case study of reforms because the end of central planning in the early 1990s meant that many of these countries implemented broad market-driven reforms as a part of thorough going economic and political changes. The Soviet Union fragmented into 15 independent states in 1991 and the new independent states had limited experience of independence and sovereignty. Czechoslovakia, which experienced the "velvet revolution" in 1989, separated into the independent states of Czech Republic and Slovakia in 1993. Yugoslavia followed a similar path with the independence of Slovenia, Bosnia, Croatia and Macedonia though the independence process in Yugoslavia was plagued by conflict and war (Lukic and

[1] The countries included can be divided into three groups: Central Eastern Europe and Baltic States (CEB) comprising Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia; South-Eastern Europe (SEE) comprising Albania, Bosnia and Herzegovina, Bulgaria, FYR Macedonia, Serbia, Romania and Montenegro; Commonwealth of Independent States (CIS) comprising Armenia, Azerbaijan, Belarus, Georgia (left the CIS in 2009), Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. Besides these countries, Turkey and Mongolia are included in the transition economies as per European Bank of Reconstruction and Development (EBRD) areas of operation.

Lynch, 1996). By 1992, an overwhelming majority of the newly independent states had transited to a peaceful and democratic market driven framework for governance. The end of central planning paved the way for implementing market-oriented economic reforms in the transition countries while allowing them to diverge politically and economically from each other (Nepal et al, 2014).

The transition countries that emerged from the fall of communist regimes in the early 1990s experienced sharp economic decline as the output of the state sector shrank while the private sector was not developed enough to quickly close the output-gap (Fan and Fan, 1998). Dramatic economic and social issues resembling those in the central planning models in the 1980s marked the early transition process. Countries such as Poland in Eastern Europe and Russia adopted a radical approach or "shock therapy" to fully and quickly open their economies (Murrell, 1993). Elsewhere, reforms were slower as they were constantly relayed and interrupted owing to political impediments and domestic conflicts such as in the Commonwealth of Independent States (CIS). For example, Hungary and Slovakia opted for a slow reform pace while reforms in Georgia and Tajikistan were affected by political turmoil and civil wars. "Market fundamentalists" prescribed quick and broad reforms for countries affected by crisis, while the "gradualists" argued that the timing and sequencing of reforms was crucial to make the reforms work (Staehr, 2005). This led to a varied range of experiences with economic reforms with diverse outcomes.

The complex effects engendered in the transition towards a market economy from central planning necessitate examining the socio-economic aspects that span well-beyond economic growth although examining the reform impacts on economic growth can serve as a starting point. Furthermore, the credibility of the transition process was enhanced by the adoption of the specific policy prescriptions under the Washington Consensus and eventually favoured by the International Monetary Fund (IMF) and the World Bank. Did the free market policy prescriptions contribute to an overall improvement in human development in the aftermath of more than two decades of reforms in the transition countries? Our aim is to explore this question and fill an important gap in the reform literature and is broader than the empirical literature focused on conventional growth analysis.

We use a dynamic panel data model based on the unique and novel bias corrected fixed effect analysis that accounts for the sample size and the corresponding bias in the estimates. We also allow for the interaction effect of a combination of different reform measures since market-oriented economic reforms include a range of measures and their impacts on human well-being is, therefore, likely to be multi-faceted. The results show that institutional reforms drove the improvements in human well-being in the transition countries. The interaction of reforms also point to a diverse set of impacts on human development implying the importance of appropriate packaging of reforms.

The remainder of the paper is structured as follows. Section 2 briefly describes the constituents of the HDI. Section 3 provides a theoretical exposition based on a detailed literature review and sets a conceptual framework for the formation of hypotheses. The hypotheses are presented in Section 4. The data and advanced panel data econometric methodology is discussed in Section 5. Section 6 presents the results. The results are further discussed with relevant policy implications in Section 7 and Section 8 concludes the paper.

2. The Human Development Index (HDI)

The Human Development Index (HDI) is a composite index based on three distinct indicators: (i) longevity, (ii) educational attainment and (iii) standard of living (UNDP, 1999)[2]. The underlying conceptual framework of the HDI stems from the capabilities and functioning approach where quality of life is translated into the capability to function in society, in terms of a set of beings and doings (Sen, 1989). Hence, the HDI had the explicit purpose "*to shift the focus of development economics from national income accounting to people centred policies*"(ulHaq, 1996).

The first Human Development Report (HDR) and the first HDI were developed in response to the "excessive preoccupation with GNP growth and national income accounts" that was based on a 'means' estimate and not in the 'ends' of well-being of the population (UNDP, 1990, p.9). It provided a tractable approach for analysis even if

[2] An explanation on how the HDI is calculated is presented in Appendix A.2.

the procedure was subject to criticism and raised several concerns among researchers[3]. For example, the HDI indicators do not reflect factors such as the rule of law and political freedom. However, this is the only feasible approach to overcoming the problem of measuring the capabilities framework of human development, as the set of human functioning is by definition almost unobservable (Ranis, 2004). Hence, the HDI, even as a rough proxy, can serve as a diagnostic tool for opportunities in a society and implies a much richer and diverse set of human aspects than just income.

According to the calculation method used until 2011, the three indicators are scaled from 0 to 1 and have equal weights on the formulaic derivation of the HDI. A combination of these reflects different aspects of overall human well-being that go beyond a simple measure of economic welfare. Since 2011, the calculation formula of the HDI has changed to a multiplicative index. However, the new and old HDI indexes have an extremely high correlation in transition economies and the focus of the analysis in this paper is mostly on the individual components of the index.

In the socialist countries, private initiative was limited or nearly non-existent in general and education and health services were generally provided for free, although there were critics about their quality, such as the lack of medical items, unequal distribution of consumer durables and wealth and a rigid educational system with access restricted to higher education. Nonetheless, literacy levels were close to 100% before the transition process (Murrell, 1991). There was also a functioning social security system with variable levels of protection across countries with a flat distribution of social transfers[4]. However, the fact that the wage distribution was quite flat masked the extreme differences in income between socialist and capitalist countries throughout history (Matthews, 1986). Thus, the transition economies had some distinctive characteristics at the start of the process: low levels of income, but good standards of access to education and health, due to "previous investments made in social dimensions by previous regimes" (Tridico, 2007, p.577). This translates to more capabilities, which were mostly constrained by a lack of social and political freedom.

[3] For a complete review of critiques of the HDI, see Kovacevic (2010).
[4] See Milanovic (1998) for a discussion of income, poverty and social transfers in communist regimes.

3. The Literature and evidence

Previous studies have not directly examined the impact of market-based reforms on the overall level of human well-being in the transition countries thus leaving a major gap in the literature. However, earlier studies have analysed the effectiveness of the reforms on individual dimensions (economic growth, education outcomes and healthcare) of the HDI providing some guidance to our research. The impacts of reforms on economic growth in transition economies have been studied extensively. Fischer et al. (1996) pioneered by using transition indicators as cumulative indexes and found a positive relationship between these and economic growth between 1992 and 1994. Havrylyshyn (2001) conducted an extensive survey on the existing literature after the effort of Fischer et al. (1996) about economic growth in transition economies, finding a wide consensus about the determinants of growth. Similarly, Black et al. (2000) attributed the shrink in national output to the flaws in the privatization efforts in the transition countries.

Most of the above studies have used the transition indicators from the European Bank for Reconstruction and Development (EBRD) as the primary source of data. However, Raimbaev (2011) used the governance indicators from the World Bank and found a crucial role for governance in economic growth. Likewise, most studies using the reform indices of the EBRD focussed on institutional indices and their performance instead of a combined analysis or interactions of economic and infrastructure reforms. Aghion and Schankerman (1999) showed that investment in physical and institutional infrastructure, besides reducing direct costs, allows lower transaction costs and a higher level of competition, through indirect effects or "transition impacts". De Macedo and Martins (2008) found the interaction between governance and infrastructure reforms to increase efficiency of investments while the interaction among the liberalization and financial reforms enhanced the profitability of investments.

Likewise, the transition process had important implications in the life of the citizens of the ex-USSR as economic and political changes were triggered. For example, factors crucial to human development such as the nature of labour relationships and the role of women in society changed with the transition to market economy. Tridico (2007)

studied the relationship between human development and economic growth during transition and concluded that investing in human development is a necessary but not sufficient condition for economic growth. Tridico argued that institutions and institutional policies are crucial for a "development process" in the context of transition economies. Tridico (2007) also notes that death rates have risen and life expectancy have declined, especially in the Baltic States and the CIS, while privatisation often generated second class health systems, and that after 1989 public spending in education fell as a consequence of a decrease in GDP[5].

However, in planned economies wages did not clearly reflect the level of education and returns to schooling were low. Therefore, moving to a market economy could have increased returns to schooling. This claim is often studied, with mixed results. Flabbi et al. (2007) found weak evidence of rising returns to education, except in Russia and Hungary where the rise was noticeable. This claim is not consensual as it can be argued that economic reforms created the conditions for better educational attainment (through growth and accessibility improvements), even if spending on education was reduced and the quality of the system decreased. It is difficult to measure the latter, and clearly being enrolled in a school is not the same as acquiring more capabilities. However, enrolment is easily measurable and is valuable information by itself. Other issues tackle the educational system in transition: the staff had been trained to teach in the old framework of central planning where skills were not developed or encouraged, while the required skills in a market economy are different (Berryman, 2000). As the system changed, workers trained under the central planning model were not qualified to work in a market economy. This implies that returns to education can be much higher for those who studied in the transition period.

The literature suggests that large scale privatizations led to the deterioration of health conditions. King et al. (2009) attributed the increase in mortality in ex-communist countries to mass privatizations leading to higher alcohol-related deaths, suicides and cardiac problems. These factors had a negative impact on life expectancy. The rapid changes in the economy and society generated stress with the above mentioned

[5] Data on public expenditure is scarce for transition economies, especially for education. The gap between spending and efficiency is also a reason why spending amounts should not be taken into account.

consequences. Tompson (2007) also argues that the problems with the Russian healthcare system, which underwent mass privatization, were not caused directly by the state of the economic system but were due to factors such as alcohol consumption and traffic accidents. These arguments are complemented by the findings in Tridico (2007, p.578) who argued, "people with low income and losers of the transition towards 'marketization' cannot afford the more expensive and more advanced private health care services". Nonetheless, it is not realistic to assume that all aspects and components of HDI such as education and health can be objectively and explicitly quantified and modelled. Therefore, there is a need for more simplified approaches to be adopted as shown in Section 5 of the present paper.

The perspectives of the public in transition economies about the transition process have also been the subject of research. Analysis of data from the Life in Transition Surveys I (EBRD, 2007) and II (EBRD, 2011) provided useful insight about the experiences of citizens, the way they adjusted their behaviour, how they see their institutions and their opinions on education, health, social issues and corruption. Findings from the first survey, conducted towards the end of the period of study in this paper, point to mixed feelings and nostalgia as only 30% of households believe they live better now than in 1989. Many perceive more investments in health and education as a priority, while a notion of widespread corruption is present, with consequences most visible in irregular payments in public health systems. General trust in society has decreased and people clearly answer that others could be trusted more in 1989 than they do now.

This study merges these branches of literature and aims to provide empirical evidence on whether market-oriented economic reforms positively affected improvements in people well-being, measured by Human Development Index which is a composite index that accounts for income, education and health. The findings of this study are especially relevant from a policymaking perspective as these centrally planned regimes (including the USSR) presided over 17% of the world's area and 9% of the world's population where state employment accounted for 90% of the labour force in 1988 (Milanovic, 1998). Likewise, universal education and health were widely available in these countries unlike other economies with similar levels of income although the quality of

public services was often ignored in order to achieve quantitative target (Federal Research Division, 1991).

4. Hypotheses and Conceptual Framework

We examine the effects of economy-wide reforms by considering the interaction between reforms and their effect on the HDI as a whole as well as on the individual components of the Index. These components followed different patterns as reforms triggered ambiguous impacts across the transition countries. While education and health suffered from under-investment after the fall of the centrally planned economies, these events also caused a sharp decline in GDP (Tridico, 2007). Thus, the transition economies adopted different strategies considering these initial conditions in the early 1990s. This led to different paces for implementation of reforms and different packages of reforms, which might have been simply institutional or accompanied by advances in infrastructure and the associated regulation framework. Figure 1 shows the evolution of the reforms and economic and social outcomes over the transition period[6].

Figure 1 shows that the HDI and its components rose steadily since 1995 despite a sharp decline in the GDP index and a decrease in life expectancy in the early years of the reforms. This is also likely to reflect the presence of functioning institutional frameworks that were already in place, and the indexes rose during the following years, as institutions adopt the characteristics of those of a market economy, though this needs to be examined. Infrastructure sector reform and changes could also be important, though perhaps to a lesser extent than institutional advances, as the latter fundamentally changed the structure of the economy and its activities.

Countries with modest or low reform efforts were struggling economically. Generally, other regions such as the CIS or Asian countries did not follow the "shock therapy" approach adopted in countries like Poland and Russia, where slower approaches were adopted. Differences in their growth patterns were clear in early periods of transition,

[6] The data for figures one to five includes a set of 25 transition economies explored further in the paper. We exclude Bosnia, Serbia, Montenegro and Turkey. The explanations are provided in section 5.

where the blocks that applied quicker reforms came out of recession earlier and achieved consistent growth throughout the 1990s (Figure 2).

Figure 1. Evolution of reform indices and Human Development Index (1992-2007)[7]
Source: EBRD (left) and World Bank/UNDP/UNESCO (right)

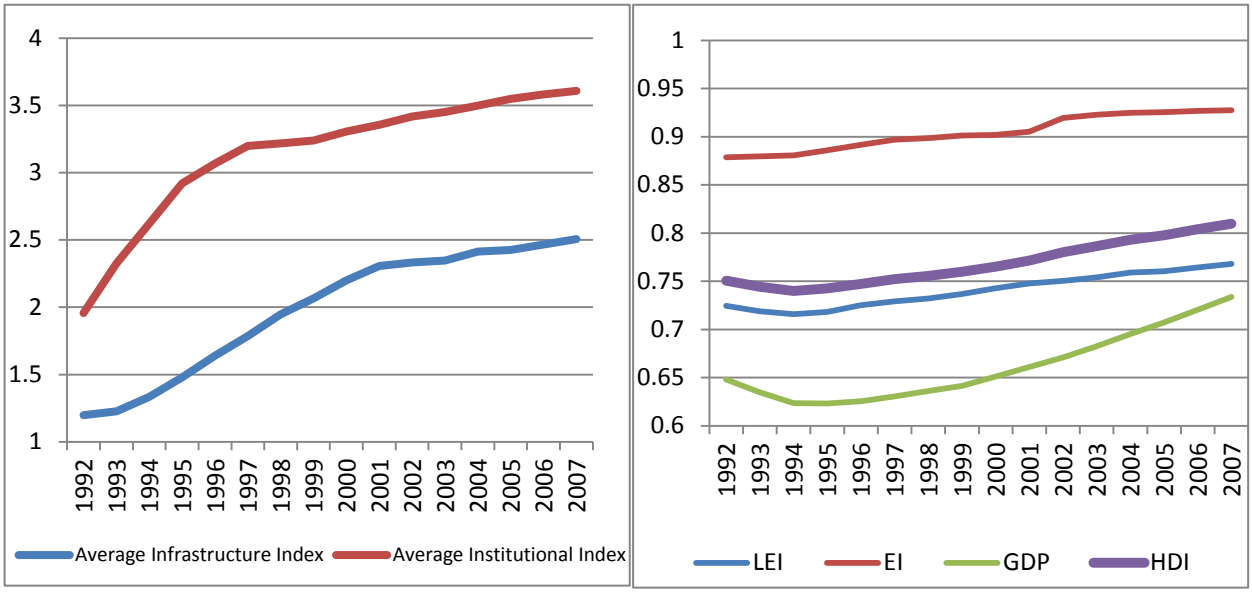
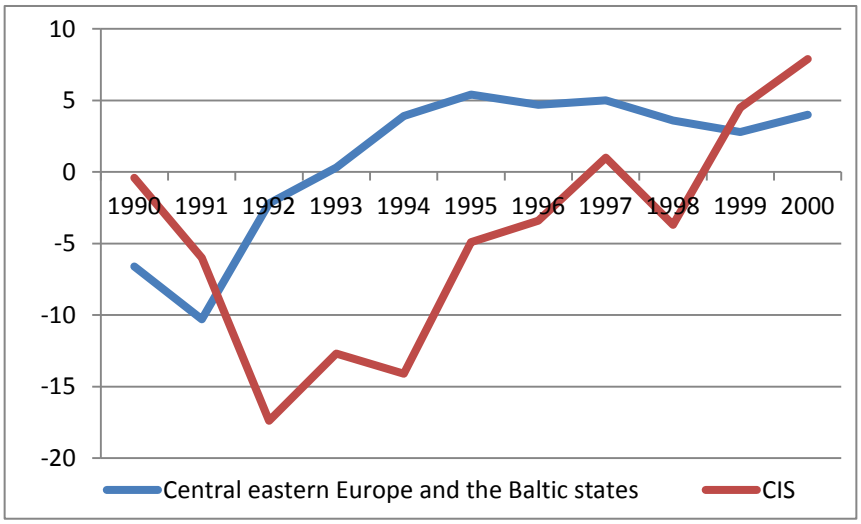


Figure 2. Real GDP growth in economic blocks (1990-2000)



Source: EBRD Transition Report 2002

[7] LEI, EI, GDP and HDI refer to Life Expectancy Index, Education Index, GDP Index and Human Development Index respectively, with data from the UNDP.

Thus, the following two hypotheses are formulated as a link between reforms and changes in dimensions of human development based on the arguments of market fundamentalists and policy linkages between infrastructure and institutional reforms respectively. The market proponents argue for quick reforms in all fronts. This implied that the level and quality of institutional and infrastructural endowments changes across the transition countries as quickly as possible post-reforms. Likewise, policy linkages between infrastructure and institutional reforms coupled with the gains from combining both types of policies can impact different dimensions of human development though to differing extent.

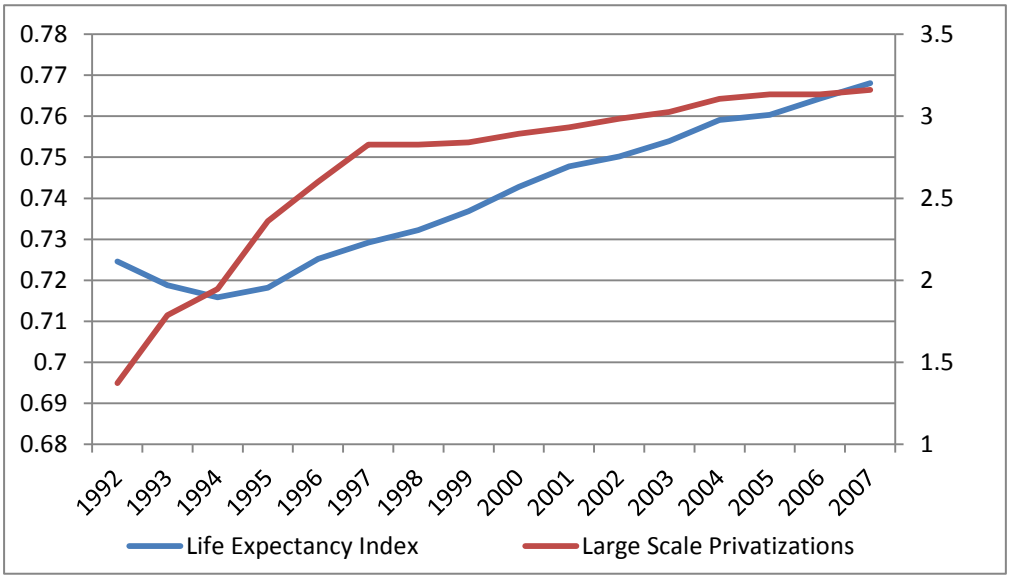
Hypothesis 1
"Economic reforms was beneficial for all dimensions of human development as the economy progressed into a market economy."

Hypothesis 2
"Infrastructure sector reforms contributed to human development."

However, other issues arise when the possibility of negative impact of reforms are considered. In many transition economies, mass privatizations were carried out quickly without appropriate institutional and legal frameworks (Stiglitz, 1999; Nepal and Jamasb, 2014). Hence, it is possible that the privatisation process created negative effects, at least in the short run. The stress caused by sudden social and economic changes could lead to increased health risks. This implies that large-scale privatizations should have a negative effect on life expectancy, even if they have different impacts on other dimensions of human development.

A combination of large-scale privatizations with insufficient governance reforms is expected to worsen the effect. Figure 3 shows that life expectancy was declining as the privatization process was advancing. It then recovered later to pre-transition values in the late 1990s across the transition countries indicating a possible causality link between life expectancy and implementation of reforms. This in turn leads us to formulate the following hypothesis:

Figure 3. Evolution of large scale privatizations and life expectancy (1992-2007)



Source: EBRD/World Bank. Life Expectancy Index on left hand side axis and Large Scale Privatizations on right side axis.

Hypothesis 3

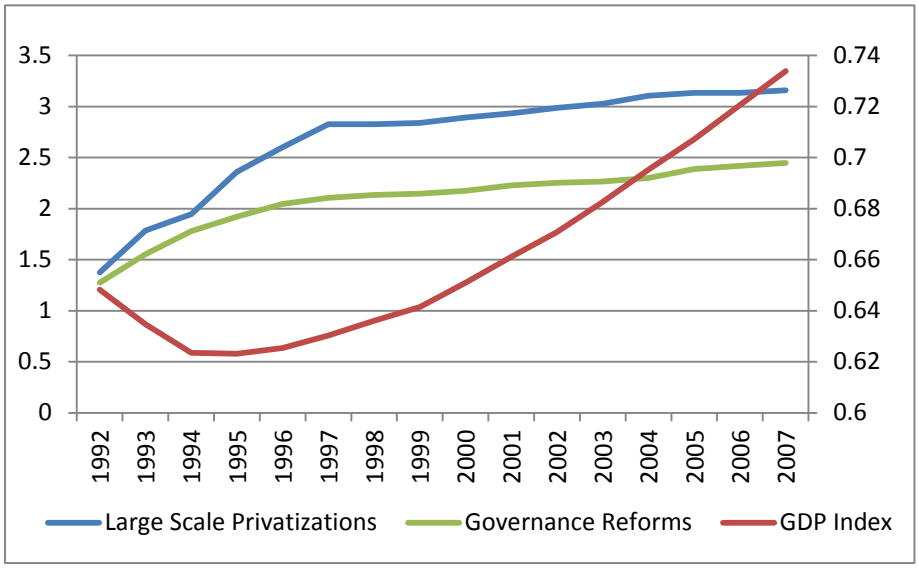
"Large scale privatizations caused adverse effects on life expectancy and degraded life conditions by creating "second class" health systems, where the poor did not have access to appropriate healthcare".

People in transition economies see public health systems as the public service where "irregular" payments are necessary in over 20% of cases, with the associated perspective that public systems deteriorated without a compensating improvement in private provision of such a service, according to data from the Life in Transition Survey (EBRD, 2007). The privatization efforts were also criticized due to poor planning and selling processes and occurred under the 'velvet gloves' such as widespread corruption, lack of rules and transparency and lack of planning of the process (Stiglitz, 1999). This also largely affected the privatization of infrastructure sectors and utilities such as electricity and telecom. Thus, it is likely that the mass privatizations could have had a negative effect on GDP.

Figure 4 shows that the privatization efforts were carried out quickly, faster than the average of all other reforms, while countries were struggling with sharp falls in GDP.

This might imply policy failure due to lack of reform complementarity. As countries were selling assets as a matter of urgency to tackle budget and debt problems, it can be argued that the process was not timed and prepared properly. Therefore, we formulate our fourth hypothesis.

Figure 4. Evolution of GDP, large scale privatizations and governance (1992-2007)



Source: EBRD / World Bank. GDP Index in right hand side axis
and other variables on the left hand side axis.

Hypothesis 4

"Large scale privatizations had a negative effect on the GDP due to the "dirty privatization" phenomenon" as explained by Black et al. (2000).

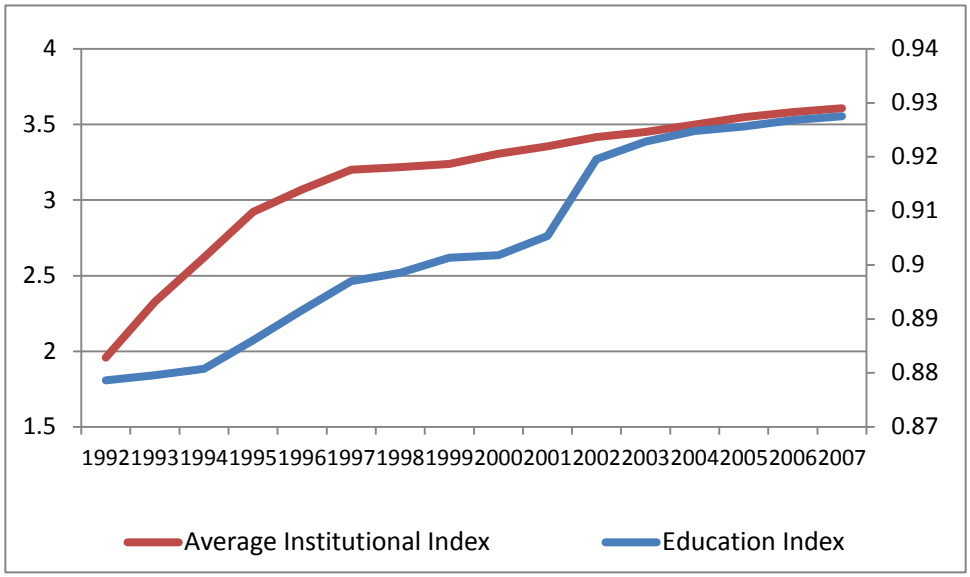
The impact of reforms in education is also an important issue in the context of transition countries. The centrally planned regimes kept returns to education low by applying a wage grid (Munich et al., 2000), which implies that transition towards a market economy should increase such returns. Increasing returns to education could have an impact on enrolment rations by creating further incentive to pursue higher levels of education and achieve a better job with a high wage.

Figure 5 shows the behaviour of institutional advances and the education index which involves school enrolment and literacy ratios. Since literacy was already very high before transition (close to 100% in most countries), changes in this index are essentially

explained by changes in enrolment ratios. Thus, the previously exposed argument leads us to formulate our fifth hypothesis.

Hypothesis 5.
"The overall reform effort should bring positive effects to enrolment in higher levels of education as returns to higher education increase, affecting the Education Index positively".

Figure 5. Evolution of institutions and the Education Index (1992-2007)



Source: EBRD/UNDP/UNESCO.
Average Institutional Index (left axis) and Education Index (right axis).

5. Data and Methodology

In order to examine the impacts of market-based structural reforms on the HDI in the transition countries we use the HDI data available from UNDP as dependent variables from 1992 to 2007. UNDP has been publishing Human Development Reports with HDI scores for many countries since 1990. Ensuring data compatibility is important and the Human Development Report Office advises against constructing trend analyses based on data from different editions (UNDP, 2005, p.212). Therefore, we have undertaken an extensive rebuild of the HDI data in order to ensure consistency in the dataset across all the years.

Table 1: Reforms and effects in HDI components

<table>
<tr><th></th><th colspan="2">GDP</th><th colspan="2">EI</th><th colspan="2">LEI</th></tr>
<tr><th></th><th>+</th><th>-</th><th>+</th><th>-</th><th>+</th><th>-</th></tr>
<tr><td>Large Scale Privatizations</td><td>Improves efficiency and stimulates investment</td><td>“Dirty privatization” without governance reforms</td><td rowspan="8">Market economy increases returns to education

Positive effects of growth and infra-structure</td><td rowspan="8">“Shock” therapy causes social problems in short-run (e.g. unemployment, school dropouts)</td><td>Can create more efficient health services</td><td>“Second class” health systems Degradation of life conditions / Quick social changes</td></tr>
<tr><td>Small Scale Privatizations</td><td>New firms
More competition</td><td></td><td></td><td></td></tr>
<tr><td>Governance Reforms</td><td>Better regulation
“Smarter” investments</td><td></td><td>Improves quality and management of services</td><td></td></tr>
<tr><td>Liberalization Reforms</td><td>Reduces price distortions</td><td>Short-run negative effects of “shock therapy”</td><td></td><td rowspan="2">“Shock therapy” causes social problems (e.g. unemployment, higher alcohol consumption, etc.)</td></tr>
<tr><td>Financial Reforms</td><td>Capital markets
Easier credit
Macro-economic stabilization</td><td>No governance reforms imply inadequate bankruptcy and lending procedures</td><td>Macro-economic stabilization avoids economic problems causing social problems</td></tr>
<tr><td>Electric/Water Infrastructure Reforms</td><td>Higher investment profitability</td><td>Possible negative effects from lack of institutions</td><td></td><td>Improves living conditions if the starting infrastructure was very poor</td><td></td></tr>
<tr><td>Telecommunication/Road Infrastructure Reforms</td><td>Investment profitability
Tears down distance barriers</td><td>Possible negative effects from lack of institutions</td><td>Makes education services more accessible</td><td></td><td>Makes health services more accessible</td><td></td></tr>
</table>

Source: Authors own collection

The new HDI data were constructed based on the methodology introduced by the 1999 Human Development Report although the UNDP changed the HDI methodology since 2010. The change included using the Gross National Income (GNI) instead of GDP and measures of years of schooling for the Education Index which may lead to a loss of many observations due to lack of data on those new variables. We constructed the income index based on per capita GPD[8] (with 2005 constant PPP$ values) and the life expectancy index based on life expectancy at birth. As mentioned above, the new method for HDI calculation from the individual components introduced in 2011 is not used. That measure has a correlation of 0.998 with those calculated for this paper, and the focus of the analysis is not on combined HDI itself. Changing the way the index is calculated would have little or no impact in results.

The lack of a consistent single dataset for the education index implied that the index was retrieved from the Human Development Reports for 1992-1995 and 1997-2007. The value for the year 1996 was based on average of 1995 and 1997 index values. The limited UNESCO data for education shows a reasonable approximation of the data behaviour. We use the same values from the first available year for two countries that started to appear on the reports after 1992 to avoid the problems of missing data[9]. We use the UNESCO data on education to construct an Education Index for Mongolia and Uzbekistan due to inconsistencies and unreasonable index jumps between reports[10]. This implies that the HDI retrieved for each country in a given year is not directly comparable to the values in the UNDP reports. However, this was necessary to improve the quality of data and make them suitable for the purpose of this study.

The data for the independent variables were obtained from the transition indicators scores published by the EBRD. The indicators are bounded between 1 and 4+ and are mainly separated in two main sections: institutional reforms and infrastructure reforms.

[8] It is common to take logarithms of GDP to proceed with analysis. However, the GDP index bounded between 0 and 1 already includes a form of logarithmic income discounting.
[9] This specific issue affects Croatia and Macedonia in 1992 and 1993 (affecting a residual 2% share of the dataset). Limited UNESCO data for 1993 does not lead us to reject the assumption of constancy.
[10] Annual Gross enrolment ratios for all levels combined (except pre-primary) are combined with limited data for literacy ratios (that are mostly constant through time) from the UNESCO database according to the Education Index formula to replicate it. This is done for Uzbekistan from 1999 onwards and for the whole sample period for Mongolia.

A score of 1 implies the lack of appropriate institutions and framework to manage the economy with a considerable distance from a market economy. A score of 4+ implies the same standards and performance as an advanced, industrialized economy, with fully working institutions and regulated/decentralised infrastructure networks[11]. The EBRD indexes have been subject to criticism and alternatives exist. Campos and Horvath (2012) point to several issues with EBRD indicators, such as a lack of information on which variables are included in the indexes and how they are aggregated, a potential and unclear mix of policy inputs and outcomes, indexes changing without changes in the underlying data and the definition of a reference point of reforms against a scenario of a "well-functioning market economy" which might be ill-defined.

The authors, instead, develop a new reform measure for 25 transition economies between 1989 and 2001 to address the issues with EBRD and World Bank reform indicators. An index is defined with additional clarity and aggregation of variables as in Lora (1997), making the reference point the maximum in-sample point. One could consider this to be a possibility for an alternative measure, but the added value of this approach is not clear for two reasons. First, even if the clarity of these measures is less debatable than for the EBRD indexes, and data points that correlations between the suggested measures and EBRD indexes decreases when the comparison goes from an input and outcome index to an input-only index, the lack of correlation between indexes is not as serious in EBRD indexes as in the World Bank indexes for the time frames considered in Campos and Horvath (2012), being always above 0.5.

The EBRD indexes show a lower degree of reform reversals. However, due to the reference point being in-sample, large changes in indexes can happen with changes in sample size given the way the indexes of Campos and Horvath (2012) are calculated. The use of the EBRD indexes can avoid this problem. This also means that if a country moves forward pushing the "frontier" of reforms while others stay the same, the index will exaggerate the index. The choice of EBRD measures is also justifiable because of the extensive time frame which allows for inference in a large balanced panel coupled with the indexes being set on common objectives, reference point and common scale

[11] There is a railway infrastructure reform index, which is not included in our analysis due to lack of data.

and that the indexes can be quality-weighted allowing to adjust for the possibility even when the national data is manipulated to influence future decisions.[12] Table 2 lists the dependent and independent variables used in this study.

Table 2: Dependent and independent variables and their sources

Variable	Components	Source
Human Development Index (HDI)	Life Expectancy Index – LEI	World Bank World Development Indicators
	GDP Index – GDP	
	Education Index – EI	UNDP Human Development Reports / own calculations using UNESCO data
LSP	Large Scale Privatization	EBRD
SSP	Small Scale Privatization	
ER	Enterprise Restructuring	
CP	Competition Policy	
TDF	Trade and Forex System	
PL	Price Liberalization	
BANKLIB	Banking Reforms and Interest Rate Liberalization	
SECFIN	Securities Markets and Non-Bank Financial Institutions	
Infrastructure Reform Indexes	Telecommunications (TELREF)	
	Electric Power (ELECREF)	
	Roads (ROADREF)	
	Water and Water Waste (WATEREF)	

Source: Authors own collection

[12] The EBRD now releases sectoral transition scores in their Transition Reports, which give further insight about progress of reforms, but that data is not available before 2010.

The dataset used is, therefore, a balanced panel where the number of cross-sections (number of countries) is 25 (N=25) for the key reform time period between 1992 and 2007 (T=16), with a total of 400 observations. The countries in the sample are Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. We focus on the crucial period of the transition period starting in 1992 (due to data availability) up to the point where the world crisis could lead to confusion in the identification of the relationship between reform levels and their results, possibly leading to incorrect inference (this is related to the issue of common shocks). Besides that, the first years of the transition period can be seen as the most important as it has been more than twenty years since the fall of the Soviet Union.

Table 3 presents the properties of the data used in this study. Most of the variability in the HDI originates from changes in income. This is expected because life expectancy and education levels tend to be fairly persistent. The Education Index is high across the transition economies due to the priority given to the educational system in these centrally planned economies. However, both Education Index and Life Expectancy Index experience some variation between and within countries, due to noticeable changes, due to school attainment levels and life expectancy respectively. In Education, Albania experienced a change of more than 10% between 1993 and 2002 alone, and other examples of noticeable variation are present, such as Belarus, Slovenia and Bulgaria. The within standard deviation is almost as large as the between standard deviation for this index (0.024 and 0.028 respectively).

For the Life Expectancy Index, within and between standard deviations are 0.021 and 0.057 respectively, which also implies noticeable variation in both ways. Most of the variation in the GDP index is between countries (0.132), with the within variation being just slightly higher than for other indexes (0.041). This shows that the within variation of the three indices is not very different and most of the differences in variation can be attributed to between variations. The correlation between human development dimensions such as the correlation between GDP and the HDI is high and the

correlation of the Education Index with other dimensions or reforms is generally low. All variables appear to be stationary, thus avoiding the pitfalls of spurious regression results. We infer from the descriptive statistics that multicolinearilty might lead to confusing inference justifying the use of a dimension reduction method in our secondary analysis[13].

Table 3: Descriptive statistics

Variable	Mean	Std. Dev	Within Std. Dev	Between Std. Dev	Min	Max
HDI	0.769	0.066	0.025	0.062	0.624	0.931
GDP	0.662	0.136	0.041	0.132	0.357	0.930
EI	0.904	0.037	0.024	0.029	0.760	0.980
LEI	0.740	0.060	0.021	0.058	0.597	0.893
LSP	2.683	0.913	0.627	0.677	1	4
SSP	3.472	0.904	0.633	0.659	1	4.33
ER	2.122	0.719	0.403	0.607	1	3.67
PL	3.83	0.625	0.408	0.483	1	4.33
TDF	3.459	1.103	0.655	0.905	1	4.33
COMPOL	2.057	0.621	0.407	0.477	1	3.67
BANKLIB	2.370	0.872	0.530	0.705	1	4
SECFIN	2.018	0.732	0.458	0.582	1	4
ELECREF	2.273	0.923	0.688	0.628	1	4
WATEREF	1.931	0.906	0.573	0.715	1	4
ROADREF	1.939	0.708	0.416	0.583	1	3.67
TELREF	2.271	0.950	0.700	0.655	1	4

Source: Authors own collection

However, the relationship between human development and reforms is complex. This is because the existing level of human development can depend on country-specific unobserved characteristics (e.g. culture, socio-economic factors and political systems) as well as the past levels of human development. The complexity justifies the need for a dynamic model that accounts for unobserved heterogeneity. Fixed effects and Random effects panel data models can account for unobserved heterogeneity. Although it is common to use a Hausman test to find the most adequate method, it is likely that

[13] Results of multi-collinearity tests are present in Table A.2. Allison (1999) points that a VIF value above 2.5 is problematic, although different authors give different rules of thumb. Belsley (1980) points that a condition index above 30% is a serious problem.

reforms are correlated with the unobserved heterogeneity that is fixed over time (Nepal and Jamasb, 2014). This violates the assumption of no correlation between the composite error term and the explanatory variables of the Random Effects model, justifying the use of a Fixed Effects model. The use of other policy evaluation techniques, such as a Difference-in-Differences (DiD) estimator is not feasible in this context, due to the lack of a control group with similar starting characteristics to the other group, the existence of continuous and multiple potential treatments, among other complicating factors. In such a complicated setting, and if the exogeneity assumption holds, the use of Fixed Effects is a standard method in the literature of conducting inference.

Thus, we use a dynamic panel data framework. However, when the time dimension (T) and the number of countries in the sample (N) are both small, the Least Square Dummy Variable (LSDV) estimator is not consistent for a finite T. Bruno (2005) developed a bias-corrected LSDV estimator (hereafter called LSDVC), under the conditions of having the error term as an unobserved white noise disturbance and having a strictly exogenous selection rule (this assumption must also hold in standard Fixed Effects and Random Effects models). In Monte Carlo experiments, the study confirms that LSDVC outperforms competing estimators. Standard errors are retrieved through a bootstrapping method with 100 repetitions. A second order bias approximation was performed using the Blundell-Bond estimator as a consistent estimator for the bias correction procedure[14]. This implies that reforms are uncorrelated with past, present and future shocks. Likewise, the assumption is stronger than the classic weak exogeneity assumption on growth regression analysis but allows for more precise estimations in a small-sample framework.

Alternative estimation methods such as GMM allow relaxation of such strict assumptions. However, working on dynamic panels in a small sample framework has some implications for those alternatives. Kurennoy (2015) shows that in the presence of endogenous regressors, both LSDVC and GMM have poor performance, but that as the

[14] Arellano-Bond and Anderson-Hsiao estimators can also perform this task. However, results are very similar between estimators, as Bruno (2005) points in Monte-Carlo studies, therefore only the results using Blundell-Bond is presented.

degree of endogeneity goes towards zero LSDVC performs better. Flannery et al. (2013) also show that LSDVC is the most accurate estimator across a range of data limitations in a list of eight tested estimators, and that in the presence of endogeneity, the regressors that are exogenous are still estimated correctly. In cases of a large coefficient of the lag of the dependent variable, LSDVC is a particularly competitive choice against other estimators, even under some degree of endogeneity. This highlights the LSDVC estimator as the preferred method for this analysis. The testing procedures broadly support the hypothesis of exogeneity on the assumption that policymakers ultimately decide which reforms to implement (see Berg et al., 1999)[15]. This justifies the use of LSDVC even further.

Another possible issue with the estimation procedure is the presence of cross-section dependence across the economic, educational and health among the transition economies. There can be bias in estimates under the presence of such a problem in dynamic panels with fixed-effects (Phillips and Sul, 2007). Hence, we test for cross-section dependence using the Cross-section Dependence (CD) test, which has good power in small samples (Pesaran, 2004). The null of cross-section independence is not rejected for any of the regressions at 1% significance level, giving no clear evidence of the presence of such an issue in our data (see Table A.3 in the Appendix). Given that the exogeneity assumption holds and there is no evidence of cross-section dependence, we validate LSDVC as the preferred method for estimation.

The tests are carried out using two models. First, a basic model without reform interactions, which allows identification of the main reforms to human development and its components, but this is potentially exposed to the multicolinearity problem. However, reform interaction is an important issue and should be approached in such a way that treats the above mentioned problems. Thus, as a second approach, a Treelet transform of the data (Lee et al., 2008) is applied in order to generate "reform clusters". The Treelet transform is a dimension reduction technique that reflects the internal structure of data and is robust to noise, generating components that are sparse,

[15] A test for strict exogeneity is discussed in Wooldridge (2002, pp.284-285). Leads of regressors are added to the original regressions and a joint test of their significant is conducted. Failure to reject the null implies strict exogeneity holds.

something crucial for interpretation purposes. It also has superior performance to other methods in the case of very high dimensionality, but in this case is mostly used for the simplicity of its output to use in regressions.

While this is an unsupervised dimension reduction technique[16], the resulting components have two major advantages. First, components that involve more than one variable have an economic interpretation related to the transition context. Second, components that result from only one variable will not be affected by multicolinearity in estimations, providing more precise inference about these variables individually. This is particularly useful for large-scale privatizations, as part of the hypothesis testing process, and variables where significance was occasionally a borderline case (e.g., COMPOL). Those components or reform clusters are then used as regressors to gain insight into the significance of reform packages. This allows us to assess the significance of interaction terms between reforms without multicolinearity. Equation 1 represents the chosen specification:

$$Y_{it} = \gamma Y_{it-1} + \beta X_{it} + \varphi_i + \mu_{it} \qquad (1)$$

where γ is the coefficient of the lagged dependent variable, β is the vector of coefficients of the explanatory variables and φ_i is a set of fixed effects. Although Staehr (2005) uses a linear time trend and Falcetti et al. (2006) use a non-linear trend capturing patterns across countries, annual time dummies are also included to capture non-linearities more appropriately. The inclusion of contemporary reforms instead of lagged ones does not significantly change the results[17].

Two models are tested where Model (1) has X_t as the set of individual reforms (the EBRD indicators with the mentioned aggregation) and Model (2) has X_t as the set of Components of the Treelet method as a representation of reform packages.

[16] Besides Treelet, other unsupervised methods like Principal Component Analysis (PCA) lead to interpretation problems as each basis vector is a linear combination of all variables. In theory, supervised dimension reduction methods are superior. The Sliced Inverse Regression (SIR) method (Li, 1991) was attempted but the issues with interpretation did not greatly improve so we follow an unsupervised method that provides more intuition for this specific dataset. Sparse PCA (SPCA) could be an equivalent method of similar performance to achieve similar goals, but not as readily available on software packages.

[17] Staehr (2005) points that the EBRD indexes are scored in the middle of the year, which already implies some distance in time to the determination of the dependent variables.

6. Results

This section presents the results specified by the two models described to assess both individual reform impact (with results possibly affected by multicolinearity), with reform packages and with the inclusion of interaction terms to account for relationships between reform packages. The first model accounts for the effects of reforms "on their own". The second model aims to assess which reform packages have been important for the HDI outcomes by using a method of dimension reduction, followed by the addition of interaction terms.

Table 4 presents the estimations for Model (1) and Tables 6 and 7 present component weights and regressions using those weights respectively. The lagged dependent variable is significant in all estimations as expected, showing the persistence of such economic and social outcomes. Standard errors are reported in brackets. It is common to use LSDVC theoretically assuming strict exogeneity of the used variables. However, in many cases, the assumption is not tested. Staehr (2005) stated, in the context of growth analysis, that "the marginal effect of reforms on growth is broadly similar whether or not one seeks to correct for the endogeneity bias" (pp.182). In this case, at 5% significance level, it should be noted that the exogeneity assumption holds, which is important for the validity of the LSDVC results.

The year dummies are jointly significant in all cases, as they capture common events and shocks that are not explained by past behaviour or reform variables, allowing for unbiased estimation of the other explanatory variables' coefficients. Figure 6 shows a plot of year dummies. While the year dummy coefficients for EI and LEI are closely centred on zero with some exceptions, GDP coefficients have a clear trend throughout the sample period. The behaviour for EI and LEI year dummies is more stable and captures some variation in the indexes not explained by reforms or past indexes, but not with a clear trend. The clearer trend on GDP could be explained by the fact that some part of the economic recovery up to 2007 is not explained by the reform variables or past GDP values, which is somewhat an expected result as there might be other influencing factors. Failing to account for the effect of these year dummies would force the other coefficients to absorb their effects, leading to biased estimates. It can be seen

that as the HDI is an average of the other three measures, the HDI year dummy coefficients lie between GDP and the other two. This highlights further the need to disaggregate the analysis into three different indexes.

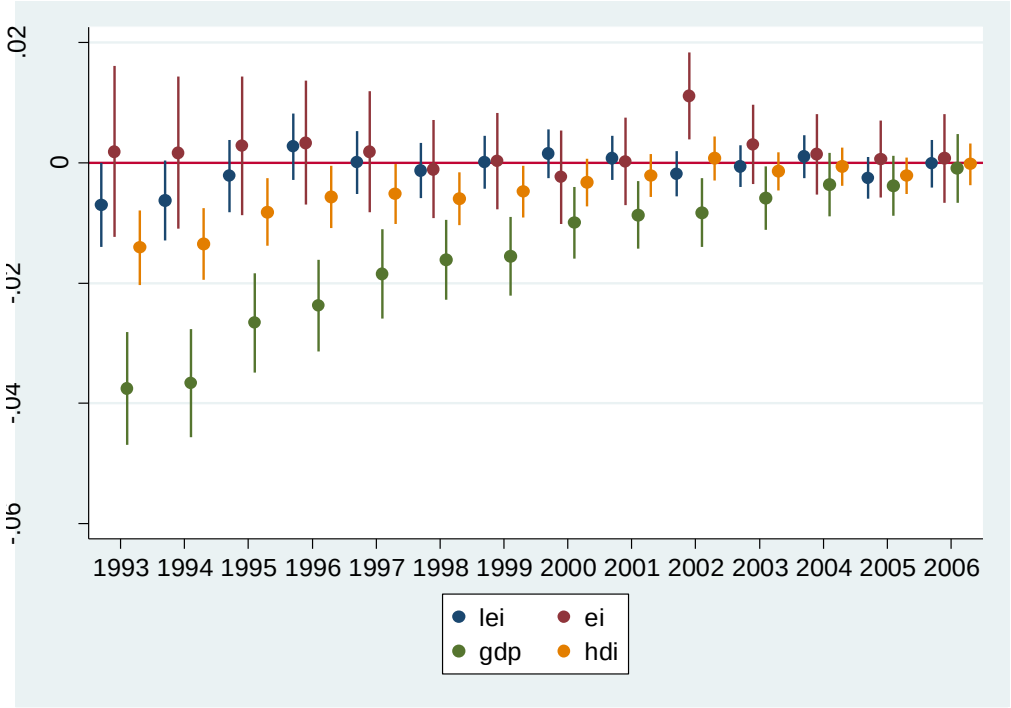
Table 4: Regression results for Model (1)

	HDI	**EI**	**LEI**	**GDP**
Dep.Var (-1)	0.9422 (0.0286)***	0.7689 (0.0517)***	0.9232 (0.0271)***	0.9688 (0.0212)***
LSP	-0.0007 (0.0011)	0.0072 (0.0024)***	-0.0030 (0.0012)**	-0.0047 (0.0018)***
SSP	0.0013 (0.0014)	-0.0040 (0.0032)	0.0017 (0.0016)	0.0067 (0.0024)***
ER	0.0005 (0.0015)	-0.0031 (0.0033)	0.0015 (0.0017)	0.0019 (0.0024)
PL	-0.0013 (0.0011)	0.0001 (0.0025)	0.0003 (0.0017)	-0.0011 (0.0019)
TDF	0.0029 (0.001)***	0.0009 (0.0023)	0.0007 (0.0011)	0.0059 (0.0016)***
COMPOL	-0.0016 (0.0013)	0.0001 (0.0029)	-0.0032 (0.0015)**	-0.0014 (0.0022)
BANKLIB	0.0009 (0.0013)	0.0034 (0.0029)	0.0015 (0.0014)	-0.0006 (0.0021)
SECFIN	-0.0009 (0.0012)	0.0012 (0.0026)	0.0019 (0.0013)	-0.0046 (0.0019)**
TELREF	-0.0005 (0.0009)	0.0034 (0.0020)*	0.0015 (0.0010)	-0.0046 (0.0015)***
ELECREF	-0.0004 (0.001)	-0.0023 (0.0023)	0.0009 (0.0011)	-0.0009 (0.0016)
ROADREF	-0.0004 (0.001)	0.0007 (0.0029)	-0.0005 (0.0015)	-0.0026 (0.0021)
WATEREF	-0.0008 (0.001)	0.0009 (0.0023)	0.00005 (0.0011)	-0.0015 (0.0016)
R2 from LSDV[18]	0.9947	0.9176	0.9914	0.9971
P-value of year dummy joint test	0.0000	0.0080	0.0001	0.0000
Number of Observations = 375. Degrees of Freedom = 323.				

***, ** and * denote significance at 1, 5 and 10% levels respectively.

[18] Stata does not report R2 from the bias corrected LSDVc estimates. However, it does report the LSDV estimates in further detail and the two measures should be a reasonable approximation of one another.

Figure 6. Plots of year dummies for all regressions (2007 as the benchmark)[19]



As the effects of reforms may vary across regions and degree of reform progress, the sample is divided into two groups: one for CIS participants and associates and another one for countries that do not participate in CIS (Table 5). Even if this approach divides the sample into two even smaller samples and makes it possible to find more specific effects of reforms in each of the blocks, it severely increases the dangers of LSDVC small sample biases as N is now below 15 for both cases. The size of the subsamples is considerably smaller than any of the samples considered by Bruno (2005). Therefore, these results must be treated with caution, and only as a complement to the main results above. Non-CIS group has 13 countries (208 observations) and CIS group has 12 countries (192 observations) in this sample[20].

[19] Note that a year dummy for the first year of the sample (1992) is not included due to the use of a dynamic model that cannot use the observations of the first year of data.

[20] The CIS group also includes Ukraine (a founding state, but only associate since 1993), Turkmenistan (founding state, but only associate since 2005) and Georgia (founding state, left the CIS in 2009).

The estimated weights of the components from the Treelet transformation are estimated for the complete sample. The seven components that explain most of the variation are selected, with the optimal cut-level of the cluster tree selected accordingly. This represents an improvement in interpretation from classic Principal Component Analysis, as components are more sparse and do not present conflicting weights. The retrieved component weights are shown in Table 6. The regression results using the component weights are then presented in Table 7.

Table 5. Results for Model (1) with CIS and non-CIS samples

	HDI		**EI**		**LEI**		**GDP**	
	NON CIS	**CIS**	**NON CIS**	**CIS**	**NON CIS**	**CIS**	**NON CIS**	**CIS**
Dep.Var (-1)	0.9992 (0.0366)***	0.8283 (0.0470)***	0.8500 (0.0593)***	0.5341 (0.0723)***	0.9430 (0.0538)***	0.9150 (0.0342)***	0.9330 (0.0302)***	0.9802 (0.0285)***
LSP	0.0021 (0.0016)	-0.0016 (0.0017)	0.0030 (0.0039)	0.0012 (0.0041)	-0.0008 (0.0026)	-0.0068 (0.0015)***	0.0036 (0.0020)*	-0.0027 (0.0024)
SSP	-0.0017 (0.0018)	0.0020 (0.0022)	0.0017 (0.0048)	-0.0032 (0.0053)	0.0017 (0.0031)	0.0015 (0.0018)	-0.0063 (0.0023)***	0.0095 (0.0031)***
ER	0.0045 (0.0018)	-0.0014 (0.0029)	0.0048 (0.0044)	-0.0044 (0.0071)	0.0041 (0.0029)	0.0022 (0.0025)	0.0022 (0.0023)	-0.0027 (0.0040)
PL	0.0002 (0.0020)	-0.0004 (0.0018)	0.0020 (0.0053)	0.0040 (0.0045)	0.0004 (0.0034)	0.0005 (0.0015)	-0.0011 (0.0026)	0.0009 (0.0024)
TDF	0.0022 (0.0017)	0.0035 (0.0017)	-0.0041 (0.0043)	0.0038 (0.0041)	0.0052 (0.0029)*	0.0010 (0.0014)	0.0045 (0.0022)**	0.0042 (0.0023)*
COMPOL	-0.0034 (0.0015)**	0.0041 (0.0025)*	-0.0060 (0.0039)	0.0015 (0.0061)	-0.0029 (0.0026)	-0.0011 (0.0021)	-0.0005 (0.0019)	0.0039 (0.0033)
BANKLIB	0.0003 (0.0017)	0.0022 (0.0027)	-0.0010 (0.0042)	0.0062 (0.0063)	-0.0020 (0.0027)	0.0032 (0.0021)	0.0042 (0.0021)**	0.0002 (0.0035)
SECFIN	-0.0003 (0.0014)	-0.0001 (0.0023)	-0.0014 (0.0035)	-0.0010 (0.0058)	-0.0010 (0.0023)	0.0069 (0.0020)***	0.0026 (0.0017)	-0.0064 (0.0032)**
TELREF	0.0006 (0.0009)	-0.0001 (0.0022)	0.0025 (0.0023)	0.0060 (0.0052)	0.0008 (0.0015)	0.0031 (0.0019)*	-0.0018 (0.0011)	-0.0050 (0.0030)*
ELECREF	0.0018 (0.0011)*	-0.0030 (0.0017)*	-0.0007 (0.0027)	-0.0039 (0.0041)	0.0015 (0.0017)	-0.0004 (0.0014)	0.0035 (0.0013)***	-0.0073 (0.0022)***
ROADREF	-0.0023 (0.0014)	0.0007 (0.0022)	-0.0032 (0.0037)	0.0048 (0.0074)	-0.0006 (0.0024)	-0.0015 (0.0018)	-0.0054 (0.0018)***	0.0013 (0.0029)
WATEREF	0.0006 (0.0010)	-0.0011 (0.0034)	-0.0039 (0.0027)	0.0074 (0.0083)	0.0005 (0.0018)	-0.0016 (0.0028)	0.0034 (0.0014)**	0.0001 (0.0046)
R2 from LSDV	0.9956	0.9872	0.9668	0.7977	0.9876	0.9895	0.9977	0.9954
P-value of year dummy joint test	0.0000	0.3213	0.0001	0.9836	0.0081	0.2686	0.3252	0.0000

- C1 is a component with a broad mix of policies, based mostly on infrastructure (excl. electricity and roads), banking and enterprise restructuring. This is an "overall reform package" and does not include market opening or privatization, but only significant advances in how the banking, governance processes and infrastructure and utilities are managed. This represents an economic reform without market opening and attracting private/foreign investors.

- C2 is a mix of trade and foreign exchange reforms and small scale privatization policies. This is an "early reform variable", as these two reforms were usually early steps in reform efforts in transition economies, and are associated with market opening and attracting private sector initiative to the economy.

- C3 to C7 consist entirely of one variable each, large scale privatization, road infrastructure reforms, trade and foreign exchange systems and competitive policy measures respectively.

Table 6: Components weights from Treelet transformation

Variable	C1	C2	C3	C4	C5	C6	C7
LSP				1			
SSP		0.71					
ER	0.46						
PL			1				
TDF		0.71					
COMPOL							1
BANKLIB	0.46						
SECFIN	0.44						
TELREF	0.44						
ELECREF						1	
ROADREF					1		
WATEREF	0.44						

Table 7: Regression results from the component weights (Model 2)

	HDI	EI	LEI	GDP
Dep.Var (-1)	0.9439 (0.0265)***	0.7761 (0.0476)***	0.9255 (0.026)***	0.9622 (0.020)***
C1	-0.0003 (0.0007)	0.0029 (0.0017)*	0.0023 (0.0008)***	-0.004 (0.0011)***
C2	0.0037 (0.0008)***	-0.002 (0.0018)	0.0019 (0.0009)**	0.0098 (0.0013)***
C3	-0.0005 (0.0007)	0.0003 (0.0015)	0.0001 (0.0008)	-0.0004 (0.0011)
C4	-0.0007 (0.0009)	0.0061 (0.0022)***	-0.0028 (0.0011)**	-0.0038 (0.0016)**
C5	-0.0005 (0.0009)	0.0007 (0.0020)	-0.0005 (0.0010)	-0.0023 (0.0015)
C6	-0.0005 (0.0009)	-0.0019 (0.0019)	0.0007 (0.0009)	-0.001 (0.0014)
C7	-0.0011 (0.0008)	-0.0002 (0.0018)	-0.0021 (0.0009)**	-0.001 (0.0013)

***, ** and * denote significance at 1, 5 and 10% levels respectively.

There is no change in results when compared to Table 4 in terms of significance with regards to components with a single variable. This implies that multicolinearity does not appear to affect the results[21]. We test for interaction between the components by adding multiplicative terms. Thus, we avoid using the original EBRD indices due to the "dimensionality curse" and multicolinearity as the significance test has low power for that. When such terms are included, inference on lower-order coefficients becomes irrelevant and only inference on the multiplicative term is legitimate (Braumoeller, 2004). Staehr (2005) states that the significance tests of the multiplicative terms have low powers, especially when variables exhibit low variations (as in the EBRD indices).

We consider a set of possible interactions: the interaction of C1/C2, C1/4, C2/C4 and C4/C7, to assess the impacts of interactions between the most important economic reform packages and their relationship to large scale privatizations and finally, the interaction of privatizations with governance reforms in the context of disorderly

[21] One of the effects of multicolinearity is that the standard errors might be too high, leading to the lack of significance of variables that are significant.

privatization process). This provides us with additional information related to the hypothesis outlined previously.

The interaction terms C1/C6 and C2/C6 are also considered in order to assess the importance of the macroeconomic reforms to trigger effects of electricity reforms. This inclusion is motivated by the findings in Nepal and Jamasb (2014) that implementing reforms is not the same as delivering results in the context of transition countries. The inclusion of these terms is to reflect the importance of the energy sector in transition and the changes it went through, in terms of efficiency and pricing. Table7 shows the signs and significance of interaction terms for each regression.

The results from the interaction terms add explanatory power to our analysis, particularly to the GDP and EI regressions as shown in Table 8. The effects on the aggregated HDI itself are less clear. It should be noted that the Variance Inflation Factor (VIF) after the inclusion of such terms increases sharply and the inclusion of more interaction terms would eventually bring back the problems associated with multicolinearity. This justifies the limited number of interaction terms that were chosen with a view to the research questions in discussion.

Table 8: The results of selected reform interactions (Model 3)

	HDI	**GDP**	**LEI**	**EI**
C1*C2	-	- (***)	+	+
C1*C4	+	+ (***)	+	- (**)
C2*C4	+	- (***)	+	+ (***)
C4*C7	- (**)	-	-	-
C1*C6	-	-	- (***)	+ (**)
C2*C6	+	+ (**)	+	-
P-value of F-test (joint significance of interaction terms)	0.3565	0.0004	0.0175	0.0055

***, ** and * denote significance at 1, 5 and 10% levels respectively.

7. Discussion of results

A first result that emerges from our analysis is that the impact of reforms on the HDI is not uniform and varies across different dimensions of human development. Specific reforms cause impacts in different dimensions and not always with an expected positive outcome. Although there is no explicit way to test for Hypothesis 1 in this context, many reforms appear to be insignificant, as the HDI appears to be positively influenced by reforms. In component analysis, only the component referring to "early market opening" is positively significant. Hence, hypothesis 1 is not confirmed, in the sense that *specific reforms matter*. The interaction of the two largest sets of reforms (Components 1 and 2) even had negative effects in GDP. Banking and governance reforms without market opening do not seem to make a positive impact.

Regarding infrastructural reforms, only the telecommunication reforms seem to produce any effects. In fact, increases in EBRD indexes of infrastructure can be caused by increases in prices that are closer to efficient levels. This makes it impossible to consistently support Hypothesis 2. This can occur because the standards of electricity and water supply were already reasonable and the reform measure used ultimately implies that reforms will mostly lead to higher prices. The increase in prices can increase the share of household income spent on them to very high levels, which can explain the negative significance of the interaction term between electricity reforms and the reform package without sale of state assets in health outcomes. The disaggregated sample also points out for a positive effect of power sector reform in non-CIS GDP and a negative effect in GDP in CIS countries – this can relate to the fact that the share of income spent on utility bills in CIS countries is larger than the one in Eastern Europe countries as prices go up in both regions.

The consistently low levels of competition policy reforms can keep a power sector reform from producing positive effects since market reforms bring extra responsibility to the competition authorities (Pollitt, 2009). This argument can be extended to the telecommunications sector. Another explanation for the lack of evidence for positive effect of infrastructure can be the inverted threshold argument, i.e. it is possible that changes in infrastructure play a crucial role when its starting levels are very low (i.e.

there are still parts of the population with no electricity, water or roads). In the case of the Soviet Union basic infrastructures were available to the population.

The impact of large-scale privatizations under Hypothesis 3 also seems to be supported by results where reforms generated a negative impact on the life expectancy index. According to disaggregated results, this negative effect might stem mostly from CIS countries. The negative impact of competition policy reforms on the life expectancy index is a striking result, but not confirmed by disaggregated results. Components 1 and 2 are also positively related to health expectancy, implying that both policies of market opening and banking/infrastructure reforms produce positive results. Reform interactions do not seem to be as important for health outcomes as is the case for other human development dimensions.

The "dirty privatization" argument of Black et al. (2000) finds support in the data (Hypothesis 4), as large scale privatizations negatively affect GDP, although small scale privatizations appear to have a positive effect. In separate CIS and non-CIS samples results tend to point that large scale privatizations are beneficial for non-CIS economies and small scale privatizations are beneficial for CIS economies, which might link to the lack of complementary reforms in CIS countries or the stage of the reform process. Governance indexes are low across the sample and the interaction term between large scale privatizations and competition policy is not significant for GDP, meaning that higher levels of the competition policy index are not triggering improved results in privatization efforts.

The impact of reforms on education is mostly related to large scale privatization and telecommunication reforms. Our composite analysis also points that component C1 (a broader reform effort) can have a positive effect, even if only at a 10% significance level. In that sense, Hypothesis 5 finds limited evidence that some reforms positively influenced educational outcomes, by creating incentives, reducing communication and knowledge barriers and possibly giving better access to funding. Some specific interactions of reforms appear to be positive, such as a mix of sale of state assets and

trade/exchange rate reforms. This evidence is limited further by the lack of any significant effect in separated CIS and non-CIS samples.

Besides the testing of our hypothesis, further comments can be made. The complexity of the effects and the possibility of a specific reform having different impacts across different dimensions are largely confirmed, justifying a component-specific analysis as well as the analysis to the impacts on the composite HDI. While many reforms and policy packages are significant across individual development dimensions, the combination of such dimensions as a representation of human capabilities shows that opening the market was a crucial factor for success.

As a final note, the results reject that the HDI is only a measurement of the GDP in a complex and richer framework. We find a correlation of 96% between the HDI and the GDP Index in this sample. However, the diversity of impacts and results that mostly follow economic theory show that, as the UNDP points out, GDP is not everything.

8. Conclusions

The aim of this paper was to explore the significance of market-related institutional and infrastructure reforms in economic and social changes of human well-being, as measured by the composite Human Development Index and its constituents. While GDP and growth regression analysis has been extensive, the main contribution of this work is the extension of such analysis to health and education, considering Sen's (1989) capabilities approach as the end of analysis, instead of a classic growth analysis.

We use the LSDVC technique, which is appropriate in this context, while trying to tackle a large set of problems in the data and gain insight into reform complementarity. While the HDI construction implies some arbitrary weightings, it reveals important information about the changes that the transition economies moved towards market economy. We find that the reform process in transition economies has sparked a diverse set of impacts across different dimensions of human development, as the countries went through quick and drastic changes. The most important result is that although, in

general, reforms generated positive impacts, policy matters and policy packages are important. The negative impact of mass privatizations is an important.

The impact of infrastructure is generally unclear as no strong evidence could be found in that sense. A possible "threshold" where reforms start generating strong effects is worth analysing, since the areas of reform where countries are closer to a market economy are the ones that appear to generate important impacts. The role of governance is not clarified in our results, which is a paradigm in need of an answer in future research. Results also point that sometimes higher levels of reform indexes do not directly lead to improved outcomes for human development dimensions.

As research in this field is very limited, other expansions are easy to number and there remains a significant future work that can be done. For example, some extensions include creating indexes that include more information such as child mortality and the spread of diseases in the Health Index. Similarly, the inclusion of inequality considering opportunities in access to education and health besides an income inequality analysis can be incorporated in the analysis.

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Appendix

A.1: Multicolinearity Tests

Variable	VIF
LSP	5.42
SSP	4.75
ER	7.46
PL	3.24
TDF	5.40
COMPOL	3.67
BANKLIB	8.80
SECFIN	4.93
ELECREF	4.16
WATEREF	4.50
ROADREF	3.29
TELREF	3.89
Mean VIF: 5.04	
Condition Index: 48.89	

Notes: Condition Index retrieved through "coldiag2" command on STATA.

All other information retrieved through command "collin".

A.2: Methodology of the Human Development Index

(According to the 1999 Human Development Report)

$$HDI = \frac{(Life\ Expectancy\ Index + GDP\ Index + Educational\ Attainment\ Index)}{3}$$

$$Educational\ Attainment\ Index = (2 * (Adult\ Literacy\ Index) + Combined\ Gross\ Enrollment\ Index$$

$$Adult\ Literacy\ Index = \frac{Adult\ Literacy\ Ratio}{100}$$

$$Combined\ Gross\ Enrollment\ Index = \frac{Combined\ Gross\ Enrollment\ Ratio}{100}$$

$$GDP\ Index = \frac{\log(GDP) - 100}{40000 - 100}$$

$$Life\ Expectancy\ Index = \frac{Life\ Expectancy\ at\ Birth - 25}{85 - 25}$$

Source: http://hdr.undp.org/en/media/hdr_1999_en_technote.pdf

A.3.: Cross-section dependence CD test

Model (1)

Dependent Variable	Test Score	P-Value
HDI	-2.29	0.022
GDP	-2.35	0.019
LEI	2.49	0.013
EI	-1.92	0.054

Model (2)

Dependent Variable	Test Score	P-Value
HDI	-2.21	0.027
GDP	-2.40	0.016
LEI	2.45	0.014
EI	-1.89	0.059

Model (3)

Dependent Variable	Test Score	P-Value
HDI	-2.16	0.031
GDP	-2.27	0.023
LEI	0.57	0.572
EI	-1.84	0.065